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LABORATORY AIDS FOR THE DIAGNOSIS OF TUBERCULOSIS*

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The disease tuberculosis has been known for at least three thousand years. Descriptions of ailments undoubtedly tuberculous in nature have been found in the ancient Sanskrit books of India and evidences of pathological conditions which can be still interpreted as tuberculosis have been found in mummies in the Pyramids of Egypt. The disease was well known and well studied by the Greeks. Nevertheless, there was a great deal of confusion in the minds of physicians and the attack on tuberculosis as a social disease could not be successfully carried out until Robert Koch discovered the tubercle bacillus in 1882, proved by animal experimentation that it was the cause of all the variegated forms of tuberculosis, and succeeded in growing it on a coagulated serum medium.

Since this time many clinical and roentenological methods have been devised for the discovery of the disease as early in its course

*Read before the Cleveland Society of Laboratory Technicians.

as possible. The examination of biopsies, that is of bits of tissue taken out of the body, has also been of aid. However, all these methods are open to grave errors and it has therefore long been recognized that the final absolute proof of tuberculosis is the discovery of the tubercle bacillus, either in secretions or excretions of the body or in the diseased tissues. This point, of course, gives the discovery of Koch overwhelming importance.

When we think of tuberculosis, we usually refer to the pulmonary form of the disease although the lung, of course, is by no means the only organ which the tubercle bacillus attacks. We shall point out a few examples which will illustrate how tuberculosis may be simulated by entirely different diseases. Thus, for instance, a disease known by the cumbersome name of "pneumoconiosis" may resemble tuberculosis so much that nothing else but the discovery of the organism will decide in favor of the one or the other. Pneumoconiosis is a scarring of the lung due to the inhalation of certain forms of irritating mineral dust. The question is highly important in industrial medicine. Many hundreds of thousands of dollars must be spent each year by corporations because pneumoconiosis is regarded as an industrial disease caused by the hazards of such trades as mining, sand blasting, etc. Then, too, cancer of the lung may cause great difficulties and here an early diagnosis is highly important since an operation for this disease is becoming increasingly frequent. There are also chronic infectious diseases of the lungs due to fungi, yeasts and syphilis. These cases must be differentiated from tuberculosis since they are not contagious and the physician may save the patient and his family the trouble and the expense of isolation. Lastly, a curious disease known as "Hodgkin's disease" may also simulate tuberculosis. This disease is susceptible in its early stages to X-ray treatment and hence diagnosis is important. You may therefore see from these examples how important the laboratory methods are in aiding the physician in the diagnosis of tuberculosis and how important it must be for you to use accurate methods and great care in executing them.

The methods at your disposal may be divided into three groups: there is first the simplest which consists of the isolation by staining of the organism from the excretions or secretions of the body; there is secondly the culture of the organism on special media; and thirdly the production of the disease in a suitable animal by inoculation of the excretion, secretion or tissue.

We will deal first with the simplest method. Of course, the standard staining is that by the method of Ziehl-Neelsen. Before, however, we discuss the stain, we must consider the material. Too

often, the technician permits himself or herself to be imposed upon by having entirely unsuitable material sent to the laboratory. It is, however, impossible to "make bricks without straw." The most common material is, of course, the sputum. You must insist upon having either the entire 24-hour specimen or the material coughed up from the time of awakening to breakfast. Entirely unsuitable is mere saliva or a few flecks of sputum which are dried in upon the cup. Until examined, the sputum should be kept in a cool place, since cold does not injure the tubercle bacillus whereas it inhibits the growth of contaminating organisms. Sometimes sputum cannot be obtained. This is especially true in children who rarely cough up sputum; they swallow it. It is therefore necessary here to wash out the stomach mornings before breakfast with about 25 to 50 cc. of saline. This material can then be centrifuged at high speed and the sediment and also the supernatant film examined. This method is unusually successful and has been so in our hands and in the hands of many workers throughout the world. We highly recommend its use. Feces may also be examined although this is less successful and furthermore still leaves open the question as to whether the tuberculosis is in the intestinal tract or in the lung. Pus is frequently sent for examination. It is not infrequent, however, in this case to find no organisms; even animal inoculation may fail since in the gross pus the organisms may be dead and disintegrated. The same may be true of pleural fluids. Urine is frequently sent and here the demonstration of the tubercle bacillus is of the highest importance. As you know, the urine is not infrequently taken from each ureter separately. You must therefore be very careful not to interchange the labels and you should check your results since the finding of tubercle bacilli in one ureter may cause the surgeon to remove the kidney. Your error in transferring the results to the normal kidney would, of course, be disastrous. In the examination of urine it is often necessary to add a drop or two of some protein precipitant such as sulphosalicylic acid in order to cause a precipitation of protein which then gradually drags the organisms mechanically to the bottom. In a perfectly clear urine, centrifugation may not bring down a sufficient number of organisms. Spinal fluids are sometimes permitted to stand in the refrigerator until a film has formed. This film is then spread out by teasing with needles upon a slide and stained in the usual fashion. The method is difficult and hours may be spent looking for organisms. Or, you may add a drop of sulphosalicylic acid and cause immediate precipitation of the protein. Centrifugation then carries the organisms to the bottom. This can only be done if the spinal fluid is given to you fresh before a membrane is formed.

The staining of tubercle bacilli in tissue has always been unsatisfactory. In part this is due to the methods. There is no doubt that tissues fixed in Zenker's solution will stain better than those fixed in formalin. If the tissue has not been fixed in Zenker's it is possible subsequently to chromate it or, apparently still better, the following method may be used for staining the tissue no matter how it has been fixed: The paraffin slides are, as usual, brought down through the various solutions to water and then are placed in a weak solution of ammonium hydroxide for five minutes. This is the important part of the technique. The slides are then washed; they are covered with carbofuchsin and steamed, but not allowed to dry, for 10 to 15 minutes. The precipitate should form but drying causes ugly discolorations and deposits. The slides are then permitted to cool for ten minutes, are decolorized about 10 minutes in acid alcohol, washed, counterstained with methylene-blue and mounted in the usual fashion. In examining under the microscope we advise you to remove the usual blue glass which is supposed to give daylight effect. In our experience this has decreased the distinctness of the red-staining tubercle bacilli and made it difficult to find them.

As to the Ziehl-Neelsen stain on ordinary laboratory material, let us give you the following principles: It is absolutely important that you spread your material on the slide smoothly and evenly. Unequal distribution makes it impossible for the stain or the decolorizing fluids to penetrate equally and will therefore give you uneven and ambiguous results. If the material is too thick, dilute with saline. If the material does not contain enough protein to coagulate upon heating it will wash off the slide. Therefore such material as, for example, urine, must be emulsified in a small amount of egg-white or any other albumin. After air-drying it is well to fix in the flame, then cover completely with carbofuchsin and steam for five minutes. As has been said before, do not permit the fluid to boil or dry. Cool and decolorize in acid alcohol for $1\frac{1}{2}$ minutes. Counterstain with methylene-blue for 2 minutes. We believe it is important to adhere strictly to a definite method and to definite time intervals. There are scores of good methods. A good technician will pick out one and adhere to it. He or she then has an opportunity of interpreting the results correctly. If the method is constantly changed, no interpretation is possible.

Not infrequently questions arise concerning the morphology of the tubercle bacillus. Perhaps one of the most persistent errors of technicians is to place too great an emphasis upon the typical picture of an organism such as is displayed in a textbook. Too often

the technician forgets that he is dealing with living substances which have a normal variability of form. Nothing is so common as the persistent error of attempting to make a diagnosis of pneumococcus or staphylococcus by the mere morphology of the organism. This is, of course, impossible. All organisms vary in their form. This is as true of the tubercle bacillus as it is of *B. coli* or of a pneumococcus. Hence you may find tubercle bacilli which are much longer than the common bacillary form, in fact which may look like short threads, or you may find very short forms which are almost coccoid. The absolute essential is, of course, the acid-fast character, although even here degenerate forms may lose the ability to hold the stain. Nevertheless, you have no right to report the presence of tubercle bacilli unless you find at least some typical acid-fast forms.

Unfortunately a considerable number of tubercle bacilli must be present in a laboratory specimen before the routine examination can demonstrate them. Corper believes that anything less than 100,000 organisms per cubic centimeter will make a microscopic search tedious or even impossible. Hence, one of the first improvements was the attempt to concentrate the number of organisms. This was done by some German workers who devised antiformin, a substance consisting of sodium hypochlorite and sodium hydroxide. One part of sputum is added to two parts of 50% antiformin. The material is shaken well, allowed to stand for 10 to 30 minutes until the mixture is cleared. The material is then either centrifuged immediately or, if no precipitate can be obtained this way, three parts of alcohol are added; the material is shaken and centrifuged again. This, of course, merely decreases the specific gravity and so permits the heavier tubercle bacillus to settle.

A word must be added concerning the significance of the demonstration of acid-fast organisms. This will depend on the accuracy of your technique. Many errors can be introduced by the laboratory technician. Slides which have once been used for tubercle bacilli stains should never be used again. Only freshly distilled water or saline made from freshly distilled water should be used in the staining operations. This is necessary because acid-fast bacilli have been demonstrated repeatedly in the ordinary faucet and therefore may appear in undistilled water. The practice of putting slides into the same staining fluid repeatedly is, of course, deplorable. Lastly, it is most important that there be no error in the labeling of the specimens. It must always be borne in mind that there are many acid-fast organisms found in nature which are not tubercle bacilli and are common saprophytes, that is not disease-

producing. It is impossible for anyone to distinguish these organisms from tubercle bacilli by mere staining and observation. In the end, the finding of a very few tubercle bacilli on a slide should be regarded as suspicious but not as entirely convincing. Its value will depend on the character of the technician.

The next step in the study of any organism is, of course, the growth on some artificial medium. Koch, as I have mentioned, was able to grow the tubercle bacillus on coagulated animal serum. This, however, is extremely difficult and it would be a problem for many of us in this room. The use of glycerin in the media by the Frenchmen Nocard and Roux was discovered and later it was found that potato was a very good medium; this was discovered by Pawlovski. Finally the egg was introduced into the media by Dorset. Practically all subsequent work must admit borrowing from these three substances. The routine method of culture meets with three difficulties: (1) the slow growth of the tubercle bacillus; (2) its special demands of nutrition, and (3) the presence of contaminants. At the present time, due to the work of several different investigators, we can destroy many of the contaminants by the use of alkali or acid solutions. It is rather astonishing that the tubercle bacillus may be subject to high concentrations of these chemicals without any great injury to its growth power. There are certainly a score of media offered at present for the growth of tubercle bacilli. In principle they are mostly alike and probably in the hands of a good technician most of them are of equal value. Our experience is with the medium of Loewenstein which combines eggs with potato flour. To this are added various salts, glycerin and an important amino-acid. Finally congo red colors the medium a brick red; this is coagulated.* The material to be examined may or may not be centrifuged, depending on necessity, and the precipitate is then treated with 6% or 12% sulphuric acid depending upon the degree of contamination. About one part of specimen and four parts of acid are used. This is shaken well in a tightly corked bottle containing

*Preparation of Loewenstein Medium:

Potassium Monophosphate....	0.4 %
Magnesium Sulphate	0.04%
Magnesium Citrate	0.1 %
Asparagin	0.6 %
Glycerin	2.0 %

120 cc. of this solution—6 gms. of potato flour added. The entire mixture is allowed to stand in a water bath at 70-80°C. for 2 hrs. Cool to 50° and add 4 eggs and 10cc. of a 2% solution of congo red. The indicator must be carefully sterilized before adding. The entire mixture is filtered through gauze. It is then put into test tubes and coagulated, as is done with the Loeffler medium.

some glass beads and then allowed to stand for one-half hour in the incubator at 37°. The material is then shaken again, poured off into a centrifuge tube and centrifuged. The sediment is streaked on the Loewenstein medium. It is important that only small amounts of material be streaked widely on the surface of the medium since the organism will not grow if not in direct contact with the atmosphere. The medium should contain condensation fluid. It is then corked, sealed with paraffin and placed in the incubator at 37°. In our experience we have obtained positive results with this medium at an average of about twenty days. The percentage of positives which you will get will depend, of course, on the character of your specimens.

Again a word concerning significance. From the direct demonstration of the tubercle bacillus to its growth is yet another step removed from the human body and we therefore subject ourselves to new sources of error; this should never be forgotten. The saprophytes discussed above may be introduced into the medium by the poor technique of the worker. Furthermore there are certain secretions which may contain acid-fast organisms which are not tubercle bacilli; so, for instance, the urine may contain the smegma bacillus. It is therefore questionable whether a positive culture without any clinical evidence justifies a physician in advising any grave therapeutic measure. In such cases it is probably advisable to undertake an animal inoculation.

Before entering upon this subject I must first call your attention to the fact that there are three types of tubercle bacilli with which we become acquainted in the laboratory: (1) the human type which is most frequently found in pulmonary tuberculosis; (2) the bovine type which is frequently found in bone and skin lesions and which is the cause of the tuberculosis of cows, is transmitted by the milk of these cows and so may be a potent cause of tuberculosis in children, and (3) the avian tubercle bacillus which is the cause of tuberculosis in birds and pigs. Whether the last has any significance whatsoever in human disease is doubtful and we may ignore it. The important point, however, is that the first two types have different disease-producing abilities for different types of animals. Luckily the guinea pig seems to be equally sensitive to both. The rabbit, on the contrary, although highly susceptible to the bovine type is relatively insusceptible to the human. This must be kept in mind in any animal inoculation work which you do.

It is, therefore, customary throughout the world to use the guinea pig as the animal for routine inoculation. So highly efficient is this animal for this particular purpose that a great deal of exceed-

ingly slipshod work has resulted which has brought the method into some disrepute. The duties of the laboratory technician do not end immediately after the inoculation of the animal. It is his or her duty to see that the animals are properly housed, fed and examined. It must not be forgotten that the guinea pig is unusually susceptible to tuberculosis. Therefore animals which are to be used for inoculation must be isolated from all other animals which have already been infected. Furthermore, each set of animals injected from any one specimen must be housed separately. It would appear to me that this should be obvious and many cases of spontaneous infection reported from different laboratories are in most cases due to a neglect of these relatively simple procedures.

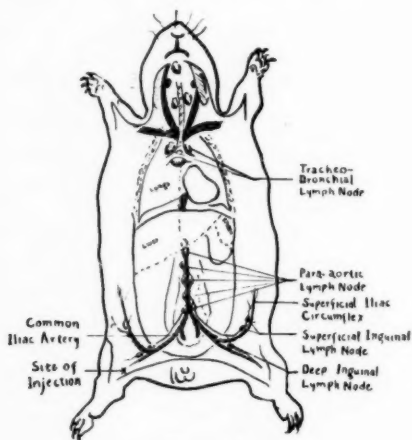


Figure 1

Owing to the fact that the disease, even in guinea pigs, has a course of weeks or even months, an opportunity is given for inter-current infections, chiefly pulmonary, which kill off the guinea pigs, often in epidemics. Over several years of experience it has been our good fortune to have had only one such epidemic. We ascribe our good fortune to two things: (1) the care of the animals, which includes clean housing with the use of hay or straw as bedding, a warm room free of draughts and the generous use of fresh vegetables or greens; (2) the second factor, as important as the first, the raising of one's own stock. Our only epidemic was introduced by strange animals which we were forced to buy. If you will isolate the mothers which become pregnant, you will speedily have enough

animals for your daily use. Let me repeat, therefore, that pregnant animals should be housed separately. Infected animals should be housed separately in a different room or at least in a different corner. The orderly should be absolutely forbidden to place the infected and non-infected animals together at any time. Let me assure you that these points are the very nucleus of success in the laboratory diagnosis of tuberculosis by inoculation.

In inoculating material one must distinguish between three different kinds: (1) uncontaminated with secondary organisms, (2) contaminated with secondary organisms, and (3) gross tissue. The first may be injected immediately. The second must be treated as has been described above for culture; subsequently, however, the precipitate must be carefully washed with saline and recentrifuged; otherwise the acid will cause an inflammation and destruction of the tissue with possible sloughing of the entire specimen. The tissue may be introduced by a simple surgical procedure into the flanks of the animal. The specimen is placed in the subcutaneous tissues, forced down toward the abdominal midline and the incision then closed with a skin clip.

It is our practice to inject the specimen, unless it be tissue, always in the right groin, that is in the subcutaneous tissues of the right thigh. The importance of this will be seen when we discuss the examination of the animal. Not more than 1 cc. of the material need be injected. The area is washed off with alcohol and the animal is placed in a separate clean cage. At the end of two weeks a tuberculin test is done on the flank after the hair has been removed with some depilatory. This tuberculin test must be done intracutaneously. The skin of the flank is exactly the right thickness for this purpose. A tuberculin of 1/10 dilution whose potency has been tested is used. A wheal of about 1 cm. is sufficient. The test is observed at 24 and 48 hours. A positive test must cause an indurated area with a white or yellow center, a bluish middle ring, and an outer red area, the so-called "three-color reaction", and this must show evidence of necrosis at 48 or 72 hours. Such a test is indubitable evidence that the animal has tuberculosis. Sometimes the diagnosis is aided by the presence of a lymphnode in the inguinal region. You may readily see that by this method it is not infrequently possible to make a diagnosis in three weeks. If such a test is positive the animal is killed, best by a smart blow on the neck—the most humane method; it is then laid out on a board in the manner illustrated by the diagram and examined in the following manner: The skin over the abdomen is removed by cross incision and stripped back; in this way the inguinal lymphnodes on the right side become visible. In practically every case, if your inoculation has

been carried out in the proper fashion these lymphnodes, either the superficial or the deep, will be enlarged and will contain a caseous center. Smear of this node will usually show tubercle bacilli and will therefore clinch the diagnosis. Just as in syphilis, tuberculosis passes by way of the local lymphnodes from one chain to the next in the midline of the body, as you see in the chart. It is, therefore, possible to watch the entire progress of the disease. Of course, the observation of the autopsy must be done in the presence of a physician who is acquainted with the character of tuberculosis in the guinea pig since there are several intercurrent spontaneous infections, not tuberculous, which may assume some of the aspects of tuberculosis. If the tuberculin test is not positive it is repeated at three and four weeks. Do not forget that only a necrotic reaction is regarded as positive. You may obtain strong red indurations from the mere injection of tuberculin but never, in our experience, a truly three-color necrotic reaction. If all the tuberculin reactions are negative, the animal is killed in six weeks and autopsied. Only in the rarest of cases will an animal fail to show an infection at this period.

Finally, a word as to the significance of the animal inoculation. If the animals have been properly cared for, if you have made no mistake in labeling the specimen, if your observation of the autopsy is correct, a positive result in animal inoculation is unequivocal proof of the presence of tubercle bacilli in the specimen which you have examined. There is no other test which, to our minds, can take its place. The final work, therefore, which we can add is that the significance of these somewhat complicated tests all depends upon the intellectual honesty and painstaking care of the technician.

LYMPHOGRANULOMA INGUINALE AND THE FREI TEST*

By DOROTHEA ZOLL, L.T.

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Lymphogranuloma inguinale is considered the fourth venereal disease. It was known as climatic bubo and has been recognized for the last seventy-five years. (Bubo is an inflammatory swelling, especially of the inguinal glands.) It was supposedly tropical in character, running a very chronic course with more or less suppuration of the affected inguinal lymph nodes. It was supposed to follow venereal exposure, especially in negro women. The lymph node symptoms did not show up as a rule, until an entrance for the infective agent was no more to be found. The cause was unknown.

The disease has been referred to as climatic bubo, strumous bubo, non-tuberculous lymphadenitis and subacute inguinal lymphogranulomatosis. In 1931 Nicholas, Durand and Favre presented a symposium at the dermatologic clinic in Strasbourg calling the disease "lymphogranuloma inguinale."

It has been suggested by some investigators, that the female may harbor the infection as a saprophyte. Cases have been observed in which the female gave a positive Frei test with no symptoms while the husband did have typical lymphogranuloma inguinale.

It has been thought that the disease is due to an organism because it can definitely be transmitted from one person to another. A case was reported, in which a physician was infected on the finger in 1904, while operating on a patient with inguinal adenitis of unknown origin. His axillary glands later went through the typical course of lymphogranuloma inguinale. In 1927, a Frei test on this patient proved positive.

Workers are inclined to believe that the condition is due to a filterable virus. A case giving a positive Frei test and a negative Wassermann, was recently reported in which a broth filtrate was used with excellent results. The filtrate was obtained from a culture made when the affected area was opened. It showed hemo-

*Read before the annual meeting of the American Society of Clinical Laboratory Technicians, Cleveland, Ohio, June 11-13, 1934.

lytic streptococcus and a variety of anaerobic or partially anaerobic organisms. The organisms were transplanted separately to flasks of dextrose bouillon and incubated eight to ten days, after which time no further growth could be obtained by reinoculation of the filtered broth. These filtrates were pooled and the incision was packed with plain gauze saturated with the filtrate. Three days after application of the filtrate, the wound was much cleaner with healthy granulation tissue and healing.

This experiment would surely lead one to believe that the disease is bacterial in origin, curable with a filtrate made from these organisms.

The disease must be differentiated from granuloma inguinale, chancroids, Hodgkins disease, tuberculosis, bubonic plague, tularaemia, malignant growth and possibly a pyogenic infection.

The diagnosis of lymphogranuloma inguinale has been greatly aided by the Frei test, a specific intradermal test first introduced in 1925.

Technic:—A suppurating lymph node not yet opened in a person having lymphogranuloma inguinale, but who has never had a chancroidal infection or syphilis, furnishes the material for the test. Pus from this node is removed aseptically through a small incision, either by using a large bore needle or through introducing the tip of a record syringe and aspirating it.

The material is diluted 1:5 or 1:10, depending on its thickness, with sterile salt solution. It is sterilized at 60C. for two hours the first day and one hour the next day at 60C. Afterwards it is tested for sterility and put in ampules. The antigen is tested on known cases of lymphogranuloma inguinale. The antigen is not tested on the source patient.

Cases of chancroid should give negative tests.

Test:—Intradermal injection of 0.1 cc. is made on the forearm and a control below it consisting of 0.1 cc. sterile saline. The results are read forty-eight hours later.

Positive reactions show red papules at least 0.5 cm. in diameter. It may show a large erythematous halo around it, or it may even be so positive as to go on to necrosis. One negative test is not sufficient to rule out lymphogranuloma inguinale. Some investigators claim that the test will not become positive until the lymph node has fused with the skin. Generally, it will be positive within 10 days to two or three weeks after the adenitis is evident, and, as a rule, the positive state persists, probably throughout life. The reaction is specific for this disease only.

The antigen will ordinarily keep its potency for six months to a year.

If the patient has a fresh syphilitic infection, the Frei reaction may be masked for a time until the syphilis is under control. Any disease causing a breaking down of the patient's allergic powers, may cause a temporary negative Frei reaction. Occasionally, fresh cases of lymphogranuloma inguinale will give a false positive Wassermann test for a period during the acute stage. Therefore, it is wise to do a repeat Wassermann and a repeat Frei test.

Through the courtesy of the physicians in charge, I am permitted to report the laboratory details of four patients at the Lan-kenau Hospital. One case was a known negative to check the antigen, one was a doubtful case with a negative result and the other two were positive according to the Frei test and clinical symptoms.

The one positive case was a colored woman 48 years of age who had a colostomy performed and was referred to the outpatient department upon release from the hospital. Later an excision of the rectum was performed and the wound was slow in healing due to the complication of lymphogranuloma inguinale.

The other positive case was a colored woman 25 years of age. She had external hemorrhoids and marked ulceration at the rectum. Upon examination of the rectum with the index finger a stricture could be felt. This was a typical early granulation stricture due to lymphogranuloma inguinale.

Through our brief experience with the Frei test we feel that it is surely an aid in proving or disproving the diagnosis of the disease, lymphogranuloma inguinale.

PIONEERS IN MEDICAL TECHNOLOGY*

Marcello Malpighi

(1628-94)



Malpighi (pronounced Mahl-pee-gee), Italian anatomist, born at Crevalore, near Bologna, held at different periods of his life, the professorship of medicine in Pisa (1656-60), Messina (1662-65), and Bologna (1666-91). In 1691 he was appointed chief physician to Pope Innocent XII.

He was one of the greatest of the microscopists, and as the founder of histology he made an epoch in medicine by his investigation of the embryology of the chick and the histology of the glands and viscera, and by his discovery (1660) of the anastomosis between capillaries. He proved that the papillae of the tongue are organs of taste. His work on the study of the liver, spleen, and kidneys greatly advanced our knowledge of the physiology of these viscera and his name has been preserved in the malpighian bodies of the kidneys and spleen and the malpighian layer of the skin.

**This is the second of a series of brief historical sketches with reproductions of some of the prominent figures who have had an important influence on medical technology.*

Editorials

THE COMMERCIAL SCHOOL FOR LABORATORY TECHNICIANS

The training of laboratory technicians may be likened to the education of physicians, pharmacists, and nurses. The history of the education of these professional people traces the gradual development of methods followed in producing the kind of men and women thought to be best qualified to pursue the career of that day. Thus, the doctors of a century ago were trained mainly through apprenticeship and preceptorship under a practitioner whose library was the principal source of academic knowledge. Then, came an organized attempt to educate them in institutions of higher learning. Some of these professional colleges were established primarily for profit. The so-called "Diploma Mills" sprang up here and there to tempt ambitious young people with money enough to purchase a certificate. Thanks to the efforts of the American Medical Association, the medical profession is no longer menaced by the activities of these unethical institutions. The nurses, too, were trained only through actual bedside practice as helpers. Little consideration was given to their preliminary education or to their class room work. Today, the education of these people has become well standardized and their qualifications further safeguarded by the state boards of examiners.

With specialization in medicine becoming more and more universal and possibly as an indirect result of the world war, technical assistants in the clinical pathological and medical research laboratories have found a place among professional groups and are now known as "laboratory technicians." As in the early days of medicine, attempts were soon made by commercially minded promoters who saw an opportunity to capitalize on the increasing demands for laboratory technicians and began to establish institutions to produce them on a commercial scale, primarily to derive profits out of the enterprise.

The primary objections to these commercial schools for laboratory technicians are (1) Since the school is conducted for gain, it

must necessarily be characterized by many features which are obnoxious to the medical profession and contrary to the best tradition of true education; (2) Inadequacy of the teaching material, both as to quantity and quality, usually by reason of not having any integral affiliation with a general hospital where actual contact with the patient may also be experienced; (3) Too short a period of training; (4) Too low admission requirements, which are not rigidly enforced; (5) Questionable qualifications of many of the instructors as teachers; (6) Often, questionable professional standing of the Director. Lectures on basic sciences appear to be too elementary or stereotyped and often too condensed to be of practical value to the students who possess not more than high school education.

In short, these commercial schools, as they are conducted today, can not possibly meet the minimum requirements as set forth by the Board of Registry of the American Society of Clinical Pathologists. The difficulty appears to be fundamental, because of the incompatibility of the aims of the commercial schools and the rigid requirements of the medical profession with respect to the training and ideals of laboratory technicians.

It is earnestly hoped that there may be found a satisfactory solution of this vexing problem which has been a stumbling block alike to student technicians and to some uninformed physicians and medical executives.

—K. I.

THE ATLANTIC CITY MEETING

It will be apparent to every member of the American Society of Clinical Laboratory Technicians who considers carefully the material published in this issue concerning the third annual convention, that the scientific papers offered on the program will be of exceptional interest and value to every one attending.

The scientific and commercial exhibits, which will be an innovation this year, will also be of educational value and of immediate interest to the entire assemblage.

The entertainment committee and the local committee on arrangements have planned a program and an annual banquet which are in accord with the traditions of Atlantic City for hospitality.

The meeting comes at a time of the year when the beauties of the Convention City can be fully appreciated.

All of these features and many more should interest the technician who has at heart, not only his scientific advancement, but also the needs of his profession, and make him eager to participate in the Atlantic City meeting.

News and Announcements

BOARD OF REGISTRY

OF A. S. C. P.

The office of the Registrar is humming with activity and keeping the personnel under a high tension in their endeavor to maintain prompt and efficient service. At the time of writing, feverish preparations are being made for the spring examinations. No less than four hundred and forty-five applicants have signified their ambition to enter the tests for the coveted certificate. Among them are residents of Canada, Puerto Rico, and Hawaii. One hundred and five clinical pathologists have been appointed as local examiners, some of whom with their associates will have to examine as many as nineteen aspirants.

It is worthy of note and commendation that all these doctors serve without any compensation at the sacrifice of their valuable time and labor. Their generous contribution to the cause of the technicians exemplifies the idealistic aims and purposes of the Registry in providing competent laboratory service for the sick.

The heightened interest in the Registry on the part of the technicians is undoubtedly due to the recommendation of the American College of Surgeons to their approved hospitals that all Laboratory Technicians carry a certificate from the American Society of Clinical Pathologists' Registry.

The Registry is making plans for an exhibit of its work at the convention of the American Society of Clinical Pathologists as well as that of the American Medical Association, both in Atlantic City. Doctor Roy R. Kracke will be in charge of the exhibits. This method of publicizing the program of the Registry has been effective in gaining many adherents to the cause. Members of the American Society of Clinical Laboratory Technicians are cordially invited to visit the booth of the Registry exhibit.

NATIONAL

A feature of the very fine program which has been arranged for the coming convention will be a demonstration on Serology at the Atlantic City Hospital by Robert A. Kilduffe, M.D.

A National Committee for Great Britain and Ireland of the International Society for Microbiology has arranged a congress in London in 1936. Sections will be as follows:

- Section 1, bacteria in their morphological, cultural and physiological aspects.
- Section 2, viruses, virus diseases, experimental tumor research and tissue culture.
- Section 3, bacteria and fungi in relation to disease in man, animals and plants.
- Section 4, economic bacteriology; soil, dairy research and industrial microbiology.
- Section 5, medical, veterinary and agricultural zoology and parasitology.
- Section 6, serology and immunochemistry.
- Section 7, microbiological chemistry.

Miss Frieda Ward announces that she will be glad to arrange a tour of inspection of clinical laboratories in Philadelphia for technicians attending the convention. The tour can be most conveniently accomplished on the day following the meeting. Philadelphia is only about an hour's ride from Atlantic City. All those interested will please communicate with Miss Ward at St. Barnabus Hospital, New Brunswick, N. J.

Awards at the coming convention of the A. S. C. L. T. include a gold medal for the best paper and/or exhibit offered at the convention by a member. Three bronze medals are also to be given.

Personals

Sarah McCarty, President of the A. S. C. L. T., was born in Anniston, Alabama. She is a graduate of Barnard College where she majored in zoology and made Phi Beta Kappa. After graduation, she was employed at Hillman Hospital for a time, after which she followed Dr. Graham when he opened a private clinical laboratory which serves many hospitals in Birmingham. Miss McCarty has been with Dr. Graham ever since except for a short time when she attended the University of Edinburgh and to which she hopes to return eventually to receive her M.D. In addition to her laboratory work, Miss McCarty also teaches a class in bacteriology and biochemistry at a Birmingham university.

Vivian Herrick supervises the laboratory work at Hillman Hospital with a staff of six other technicians to assist her. Mrs. Herrick has been at Hillman Hospital for quite a number of years and at present is working on her B.S. degree in addition to her duties as Secretary of the A. S. C. L. T.

Mrs. Christine C. Seguin, wife of Doctor Arthur C. Seguin, is a graduate of Ricks Normal College of Rexberg, Idaho, attended the Training School for Nurses of the General Hospital of Salt Lake City, Utah, and received technical laboratory training at the Medical Research Laboratories in Chicago. Mrs. Seguin is Treasurer of the A. S. C. L. T. and is at present doing additional work at Mundelein College in Chicago.

Miss Frieda Ward has moved to New Brunswick, New Jersey. We extend best wishes for success in her new position.

Mr. and Mrs. Harry Macko of Cleveland announce the birth of a daughter, Patricia Jane.

Dr. Edna Harde Young, American bacteriologist connected with the Pasteur Institute, has been awarded the Guy Amerongen Prize for cancer research, for a paper submitted to the French League against Cancer on the thesis that chemically preserved foods aid the growth of cancer cells.

Dr. K. F. Myer, professor of bacteriology and director of the Hooper Foundation for Medical Research of the University of California, has been nominated for election to the presidency of the Society of American Bacteriologists.

STATE

New Jersey

The New Jersey Society is just completing its second year.

The year opened with a business meeting in October. A number of members attended the Interstate dinner meeting which the Philadelphia Society held in October. In November a Tri-State meeting was held in Newark to which Registered Technicians from New Jersey, New York, and Pennsylvania were invited. Dr. Asher Yaguda spoke about the Registry and Frieda Ward told about the beginnings and growth of the A. S. C. L. T.

Instead of outside speakers this year, various subjects such as Parasitology, Spinal fluids, Serology, and Bacteriology have been discussed. Open discussion has followed each paper. The Annual Banquet and election of officers will be held in May.

The Society meets at the North Jersey Academy of Medicine in Newark on the third Wednesday and visitors are welcome.

New York

The New York Society of Registered Clinical Laboratory Technicians was formed on January 9, 1935. There are twenty-one charter members. Meetings are held on the second Wednesday of each month.

At the first annual meeting, held on April 10, 1935, the following officers were elected: President, Mr. Edward B. Ellis; Vice-President, Miss Barbara F. Muellerschoen; Secretary-Treasurer, Miss Mary Preston Clapp.

Ohio

A meeting of the Laboratory Technicians of Ohio District No. 1 was held at the Massillon City Hospital, Massillon, Ohio, Wednesday, March 20th. Doctor J. D. Holston, the hospital pathologist, gave a paper on "The History of Diabetes" and Miss Edna Rigdon, the hospital technician, presented several case studies of diabetic patients. Miss Edith McClenahan, technician from Massillon State Hospital, assisted in arranging the program.

The Cleveland Society of Medical Technicians, Ohio District No. 4, meet on the third Thursday of each month. A Methods Library Committee has been appointed whose duty it is to give a review of laboratory methods appearing in the current literature. Through sub-committees it is covering the English and a great deal of the foreign literature in an attempt to keep their members in touch with the most recent laboratory methods and modifications.

Texas

Ida F. Levinson, L.T., second vice-president of the Texas Society of Clinical Laboratory Technicians, wishes to announce that a meeting will be held in Houston, Texas, on October 11-12, 1935. Scientific papers and exhibits will go to make up an interesting and instructive program.

State and local or district organizations are invited to send in any notes of their meetings, elections, or other items of information. Address Sister Alma Le Duc, St. Thomas Hospital, Akron, Ohio. These will be printed in each issue as far as space permits.

Book Reviews

THE LABORATORY BOOKSHELF

It was Dr. Harvey Cushing who said:

"Joseph Lister was a practitioner of surgery and at the same time a savant—or as near an approach to one as the definition of the term can permit a surgeon to be. It is a rare combination, for the two careers are well nigh incompatible, one or the other of them, by those capable of either, usually having to be sacrificed. Science demands of the true savant a devotion which admits of no sharing, wholly unconcerned with the application of theory, he consecrates himself to a form of intellectual activity which brooks no interruption. The surgeon's time, on the other hand, lies open to the behest of afflicted persons who in mounting numbers seek his aid, and, if he is at all benevolent, they cannot be refused. Seldom, therefore, can the diverging paths be trodden together, the straddle becomes too great."

These remarks apply with equal force to the clinical laboratory technician, as well as to the practitioner of surgery. Very few of us continue to be scholars after our student days. But books remain our very present help in time of trouble, and should become our best laboratory friends, along with the test tube and the microscope.

Books vary in their content and method. Alice was ordered by the Duchess to "begin at the beginning and read straight through to the end." Some laboratory books demand this kind of reading. Others are designed for reference and consultation. A third group of books aims at the interpretation of laboratory procedures in their practical application to medicine. This type of book is more understandable to the doctor than to the technician. Nevertheless, we like to find out something about the meaning of the tests we are carrying out.

It will be the purpose of this department to review books of all three types and to recommend to technicians that they stretch their budgets to buy such of them as well be of definite help in their work.

The books reviewed in this issue, and many others, will be on exhibit at the Convention.

CLINICAL LABORATORY METHODS, by Pauline S. Dimmitt, Ph.G., Medical Technologist for the Stout Clinic, Sherman, Texas. Illustrated with 36 engravings, including 7 full page colored plates. 156 pages. Published by the F. A. Davis Company, Philadelphia, Pa. Price \$2.00 net.

The author does not attempt the lengthy descriptive details of many of the more voluminous works on clinical laboratory methods, but proves by her selection of procedures embodied in her book that she has had long experience as an instructor in the laboratory, particularly as applied to laboratories doing routine analytical work.

Practically all necessary, modern analytical procedures covering urine, blood, cerebrospinal fluid, gastric and fecal analyses, and bacteriology are given. A chapter on volumetric solutions is wisely included.

In the chapter on blood examinations a somewhat modified, but simple and accurate method for doing platelet counts as used at the Rockefeller Institute for Medical Research is especially commended. To the experienced technician who realizes the variability of platelet counts, this method will be worthy of adoption.

The printing and photography are noticeable features because of their clearness—the colored reproductions being unusually so.

To the laboratory student or to the experienced technician desiring a small, concise, workable compilation of methods, Mrs. Dimmitt's book is to be highly recommended.

CLINICAL DIAGNOSIS BY LABORATORY METHODS
(A working manual of clinical pathology) by James Campbell Todd, Ph.B., M.D., Late Professor of Clinical Pathology, University of Colorado, School of Medicine, and Arthur Howley Sandford, A.M., M.D., Professor of Clinical Pathology, University of Minnesota, and Head of Section of Clinical Laboratories, Mayo Clinic. Seventh Edition, 1934. 765 pages. W. B. Saunders, publishers. \$6.00 cloth.

This manual was designed primarily as a text book for medical students, just at the time when clinical microscopy was emerging as a branch of medicine (First edition in 1908). It was one of the first satisfactory text books in this field and the frequent editions

and revisions have kept it up to date. It has always been the "Bible" of technic as far back as many of our laboratory memories reach.

This new edition boasts some excellent additions. In the chapter on blood chemistry more recent modifications for the determination of blood sugar, uric acid and calcium are outlined. The photomicrographs especially in the section "The Blood" have been improved. The section on the complement fixation test for syphilis has been amplified and now covers two standard methods. As always, the chapters on Animal Parasites and Gastric Contents can be especially recommended.

As in all text books, the method is didactic. It precludes much discussion or interpretation and offers little choice of method. However, most of us "like to be told" and what the book loses in breadth of scope, it more than gains in preciseness and clarity. Reference is seldom made to the literature.

The chapters on Bacteriologic Methods contain a table of synonyms proposed for the names of bacteria. This is particularly welcome to those of us who were brought up before the American Society of Bacteriologists proposed these changes.

This book will serve as the best keystone volume for any technician attempting to assemble a library.

Abstracts

TUBERCULOSIS, THE COSTA REACTION, Results of Two Hundred Cases, R. H. Kampmeier, M.D., F.A.C.P., Jour. Lab. & Clin. Med., Vol. 20, No. 5, p. 531-537, Feb., 1935.

After giving details of the technic of the test and a review of the literature on it, Dr. Kampmeier gives his own experience in testing 200 cases covering a wide variety of pathologic conditions, especially in T.B., malignancy, heart disease and syphilis. His conclusions are as follows:

1. The Costa Reaction is a very simple test which can be carried out in twenty minutes and does not necessitate venipuncture. Its purposes may be compared to those of the sedimentation test.
2. The test was carried out in 200 cases which include a variety of pathologic conditions.
3. In active tuberculosis the test is positive in a high per cent of cases.
4. Ninety per cent of the cases of proved malignancy were Costa Positive.
5. Syphilis apparently has no influence on the reaction.
6. Fever in itself does not give a positive reaction.

PULMONARY ASBESTOSIS, A STUDY OF THE SPUTUM IN, by Robert C. Page, B.A., B.M., Amer. Jour. Med. Sc., Vol. 189, No. 1, p. 44-55, Jan., 1935.

Although this paper is essentially for the clinician, the technician will be interested in the "Technic for Demonstration of Asbestos Bodies" given on page 46 and the "Technic for Demonstration of Elastic Tissue" given on page 47.

**ENDAMOEBA HISTOLYTICA, THE CULTIVATION OF
IN ERLLENMEYER FLASKS, William W. Frye and Henry
E. Meleney, Science, Vol. 81, No. 2091, Jan. 25, 1935.**

The authors found that much labor and expense is saved by

growing cultures of the endamoeba histolytica in Erlenmeyer flasks, as a single test tube culture is sufficient for the inoculation of only one kitten, and in testing for the pathogenicity of a strain usually twenty kittens are used.

Though practically any of the accepted media could be used they use the media recommended by Dobell and Laidlaw (Parasitology, 18: 283-318, 1926). They use 250 cc. flasks and find that one flask provides the same number of amoeba as approximately twenty-five to thirty tubes of 25 cc. capacity.

**BLOOD FAT TOLERANCE TESTS IN MALNUTRITION
AND OBESITY, Harry Blotner, M.D., Arch. Int. Med., Vol.
55, No. 1, p. 121-130, Jan., 1935.**

The author gives a method of studying fat tolerance in a manner similar to the glucose tolerance test.

A dose of 100 Gm. of fat in the form of 500 cc. of 20% cream was employed as a test meal. It was administered to the patients in the morning after fasting over night. Samples of blood were taken fasting, 2, 4, 6, and 8 hours after the test meal. The plasma cholesterol was used as an indicator of the concentration of blood fat. The author plotted fat tolerance curves in normal cases, in cases of malnutrition with and without insulin, in obesity with and without the administration of pituitary extract, and in diabetes insipidus taking pituitary extract.

**Comparative value of various fixators for determination of
glycogen in hepatic tissue. Burghgraeve: Bull. Histol.
appl. 10: No. 4, 129, 1933.***

The best results in the preservation of glycogen in the cells are obtained with 35-40% formalin. However, this hardens the material very quickly. Absolute alcohol is good but does not penetrate quickly enough to prevent glycolysis; it must therefore be mixed with formol. The best staining method is that of Best; the best staining time is between $\frac{1}{2}$ and one hour.

New methods for embedding objects which are difficult to cut.
Graupner, H.: Mikrisk. f. Naturf. 10: H. 8, 186, 1932.*


Since the ordinary paraffin procedures are not suitable for hard objects the following embedding methods are recommended: (1) methyl benzoate celloidin; (2) methyl benzoate mixed with 96% alcohol; (3) Terpinkal; (4) Dioxan which is miscible in water.

Microscopic crystal formation of human body fluids. Szauter:
Orv. Hetil. 1934, 43.*

Upon drying body fluids (cerebro-spinal fluid, serum, ex- and transudates) upon a slide the dissolved organic and inorganic substances crystallize out. Differences in the composition of these fluids in various disease conditions make themselves evident in the microscopic picture. In tuberculous meningitis a marginal ring occurs. The octohedral sodium chloride crystals disappear, and silica-like crystal forms increase. Uremic blood serum also is altered. The crystal leaves in the marginal zone are composed of larger angular formations and the crystal net of the inner zones shows a change. The depicted changes can be seen still better if the diluted serum is coagulated upon the water bath, centrifuged, and the crystal forms of the supernatant liquid investigated. In uremic serum the marginal zone is broader, and there are, beside inorganic crystal forms, uric acid crystals in the middle zone.

* Abstracted from Centralblatt für Allgemeine Pathologie und Pathologische Anatomie 61: January 15, 1935. Translation by S. E. Albert, Feb. 8, 1935.

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PAST DISCOVERIES

Hammarsten discovered the function of fibrinogen in the coagulation of the blood in 1871.

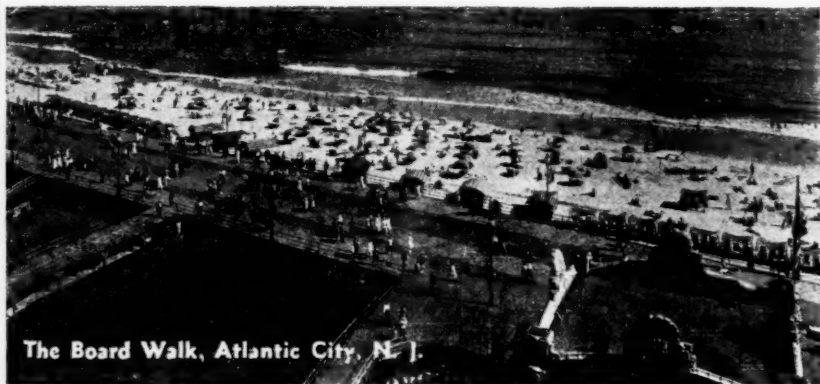
Hoppe - Seyler discovered nuclein in the blood corpuscles in 1871.

Obermeier discovered the spirillum of relapsing fever in 1873.

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P R O G R A M

Third Annual Convention A. S. C. L. T.



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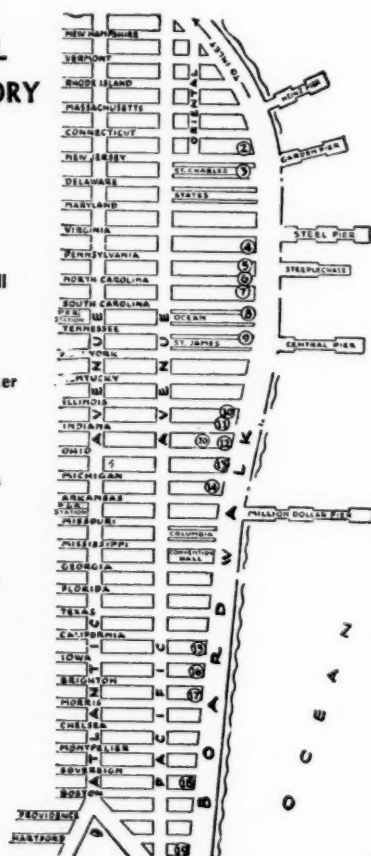
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- 17 Chelsea
- 18 Ostend
- 19 President
- 20 Claridge



REGISTRATION

The Bureau of Registration will be located at Haddon Hall, Boardwalk at N. Carolina Ave. Members of the Committee on Registration will be present to assist those who desire to register.

REGISTER EARLY

The entire committee will be at the desk from 8 to 10 a. m., June the 10th. Thereafter a committee member will be present during the remainder of the session.

WHO MAY REGISTER

Only members, honorary members, invited guests, and Clinical Laboratory Technicians who are not members but interested in the program.

Members who have their membership card with them can be registered with little or no delay. They should fill out the white registration card and present it together with their membership card at the registration desk. There the committee member will compare the cards, return the membership card, and supply the member with a badge, a copy of the official program, and other printed matter of interest to those attending.

ENTERTAINMENT

The Entertainment Committee, and the local Committee on Arrangements have promised three days of superb entertainment, with the grand finale, the Annual Banquet, coming Wednesday evening, June 12th, at 7 p. m. Watch for daily announcements.

EXHIBITS

The scientific and commercial exhibits will be located at convention headquarters. The general arrangement of booths and decorations will be carried out in a pleasing manner as a feature of this year's convention. Admission will be limited to individuals wearing membership or other badges of the Society. The exhibit will not be open to the public.

Open from 12 to 2 and 4 to 9 p. m. daily.

COMMITTEES

On Awards

(Honorary members or non-members)

- Dr. Phillip Hillkowitz, Chairman, Board of Registry, A. S. C. P.,
Denver, Colo.
Dr. Walter E. King, Parke, Davis & Co., Detroit, Mich.
Dr. Kano Ikeda, The Charles T. Miller Hospital, St. Paul, Minn.
Dr. Malcolm T. MacEachern, Associate Director, American College
of Surgeons.
Dr. Robert A. Kilduffe, the Atlantic City Hospital, Atlantic City,
N. J.

Entertainment Committee

- Phyllis Stanley, Chairman, Presbyterian Hospital, Newark, N. J.
Irma Jackson, Evangelical Deaconess Hospital, Cleveland, Ohio.
Lura Mae Shipp, Lutheran Hospital, Cleveland, Ohio.
Frieda Ward, St. Barnabus Hospital, New Brunswick, N. J.
Vivian Herrick, Hillman Hospital, Birmingham, Alabama.

Publicity Committee

- Luella Gifford, Chairman, 339 Boush Street, Norfolk, Va.
Josephine Neane, Atlantic City Hospital, Atlantic City, N. J.
Madie Murphy, Hillman Hospital, Birmingham, Ala.

Reception and Registration

- Madge Baldwin, Chairman, Roseland Hospital, Chicago, Ill.
Martha Moore, 2111 Ernest Street, Jacksonville, Florida.
Pauline Dimmitt, 302 M & P Bank Bldg., Sherman, Texas.

Committee on Exhibits

- Sarah McCarty, Chairman, 805 Medical Arts Bldg., Birmingham,
Alabama.
Phyllis Stanley (ex-officio).
Sister M. Joan of Arc (ex-officio).
Faith Dravis, Grandview Hospital, Eau Claire, Wisconsin.
Elizabeth Cramer, 164 Market Street, Lexington, Ky.

Program Committee

Sister M. Joan of Arc, General Chairman, Mercy Hospital, Baltimore, Md.

Sub-Committee on Questionnaires

M. Eleanor Behr, 138 N. Kenwood Ave., Baltimore, Md.

Sister M. Claude, Mercy Hospital, Baltimore, Md.

Myrtle Sand, 1850 W. Jackson Blvd., Chicago, Ill.

Irene Satterfield, 1805 Tenth Ave., South, Birmingham, Ala.

Mabel Varner, Missouri Methodist Hospital, St. Joseph, Mo.

Anna Wassell, 863½ W. Lombard St., Baltimore, Md.

Dorothea Zoll, 7220 Summers Road, Philadelphia, Penn.

Committee on Local Arrangements

Edna Wilson, Chairman, Atlantic City Hospital, Atlantic City, N. J.

Florence Steinmig, Atlantic City Hospital, Atlantic City, N. J.

Josephine Neane, Atlantic City Hospital, Atlantic City, N. J.

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For the Central States:

Harry A. Macko, Chairman, Charity Hospital, Cleveland, Ohio

For the Southeastern States:

Madie Murphy, Hillman Hospital, Birmingham, Ala.

For the Northeastern States:

Phyllis Stanley, Presbyterian Hospital, Newark, N. J.

For the Northwestern States:

Helen Olsen, Huron Clinic, Huron, S. D.

For the Southwestern States:

A. L. Coad, Coroner's Office, Hall of Justice, Los Angeles, Calif.

Committee on Insignia

Naomi Zittrouer, Chairman, 719 Doctor's Building, Atlanta, Ga.

**AMERICAN SOCIETY OF CLINICAL
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THIRD ANNUAL CONVENTION

Headquarters, Haddon Hall, Atlantic City, N. J.

JUNE 10, 11 and 12, 1935

Registration—June 10, 8 to 12 A. M.

Exhibits—Open 12 to 2 and 4 to 9 P. M. Daily.

MONDAY MORNING, JUNE 10, 9 to 12 A. M.

Executive Session.

Invocation by the Reverend Warren W. Way, D.D., St. James
Episcopal Church, Atlantic City, N. J.

Minutes of the 1934 Convention.

Appointment of Committees: Nomination, Resolutions.

Announcements.

President's Message—Sarah McCarty, Birmingham, Ala.

History of Hospitals

By Dr. Robert A. Kilduffe, Atlantic City Hospital, Atlantic
City, N. J.

Reports—Executive Committee, Publication, Membership.

By John H. Conlin, Vice-President, Detroit, Mich.

Advisory Board: By Madge Baldwin, Chicago, Ill.

Counsellors: By Harry A. Macko, Cleveland, Ohio.

Insignia: Naomi Zittrouer, Atlanta, Ga.

Treasurer: Christine C. Seguin, Niles Center, Ill.

Adoption of Reports.

New Business: Voting on Proposed Changes in Constitution and
By-Laws.

MONDAY AFTERNOON, JUNE 10, 2 to 5 P. M.

GENERAL PROBLEMS OF TECHNICIANS

Presiding, Sister M. Joan, R.S.M.

1. *Summary of Returns from Questionnaire.*
By Sr. M. Joan of Arc, Mercy Hospital, Baltimore, Md.
 2. *Problems of Laboratory Work and Administration as They Affect the Technician.*
By Dr. Phillip Hillkowitz, Denver, Colorado.
 3. *Technician's Status and Place in the Hospital.*
By Dr. Asher Yaguda, Beth Isreal Hospital, Newark, N. J.
 4. *Keeping Abreast of the Times.*
By Sr. Alma Le Duc, St. Thomas Hospital, Akron, Ohio.
 5. *Problems of the Technician in a Small Laboratory.*
By Myra Effinger, Altoona Hospital, Altoona, Penn.
-

TUESDAY MORNING, JUNE 11, 9 to 12 A. M.

HEMATOLOGY

Presiding, Frieda Ward

1. *Hemoglobin Estimations.*
By Dr. Russell L. Haden, Cleveland Clinic, Cleveland, Ohio.
 2. *Laboratory Diagnosis of Leukemic States.*
By Dr. Roy R. Kracke, Emory University, Emory, Georgia.
 3. *Aplastic Anemia, with Recovery and Follow-Up of Two and One-Half Years.*
By Bessie B. Morris, St. Vincent's Hospital, Staten Island, New York.
 4. *Clotting Indices: Theory and Technic.*
By Lena A. Lewis, Lancaster General Hospital, Lancaster, Penn.
 5. *Laboratory Procedures Involved in Transfusions.*
By Henrietta Lyle, St. Joseph's Hospital, Lancaster, Penn.
 6. *Cytology of Spinal Fluids.*
By Phyllis Stanley, Presbyterian Hospital, Newark, N. J.
- Round Table Discussion opened by Cecil Goheen.*

TUESDAY AFTERNOON, JUNE 11, 2 to 5 P. M.

CHEMISTRY AND MISCELLANEOUS

Presiding, Luella Gifford

1. *Urea Clearance and Urea Determinations.*
By Dr. Donald Van Slyke, Rockefeller Institute, New York City.
2. *The Value of Blood Chemistry in Clinical Medicine.*
By Dr. Walter B. Martin, Norfolk, Va.
3. *Spinal Fluid Findings in Poliomyelitis.*
By Dr. Maurice Brodie, New York University and Belvue Medical College, New York City.
4. *Blood Phosphatase.*
By Paul C. Brown, Beth Israel Hospital, Newark, N. J.
5. *Pathological Technic.*
By Martha Moore, Jacksonville, Fla.

Round Table Discussion opened by Frances Pennypacker.

WEDNESDAY MORNING, JUNE 12, 9 to 12 A. M.

BACTERIOLOGY

Presiding, Sister Alma Le Duc

1. *Allergic Technic in the Laboratory.*
By Dr. Warren T. Vaughan, Richmond, Va.
2. *Examination of Clinical Material for Tubercle Bacilli.*
By Frieda Ward, St. Barnabus Hospital, New Brunswick, N. J.
3. *Laboratory Studies in Chronic Arthritis.*
By Cecil Gowen, Newark, N. J.
4. *Pathogenic Fungi: Studies from Two Fatal Cases.*
By Fanny Warnock, The Burnham City Hospital, Champaign, Ill.
5. *Laboratory Studies in Dysentery Epidemic Due to Atypical Flexner Organism.*
By Margaret Kirby, Medical Center, Jersey City, N. J.

Round Table Discussion opened by Vivian Herrick.

WEDNESDAY AFTERNOON, JUNE 12, 2 to 5 P. M.

SEROLOGY AND BUSINESS

Demonstration on Serology at Atlantic City Hospital.

Dr. Robert A. Kilduffe.

Report of Nomination Committee.

Report of Resolutions Committee.

Election of Officers.

WEDNESDAY EVENING, JUNE 12, 7 P. M.

ANNUAL BANQUET.

Toastmistress: Vivian Herrick.

After-dinner Speakers:

- Dr. J. S. McLester, President-elect of the A. M. A.
- Dr. Malcolm T. MacEachern, Associate Director of the A. C. S.
- Dr. Walter E. King, Registry of Technicians.

Awards—To be made by Committee on Awards.

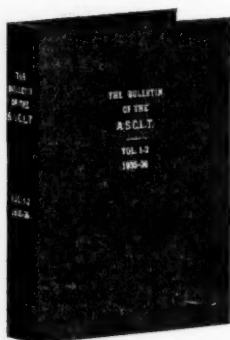
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